

REMARKS

While the Office Action indicates that a copy of PTO-892 was attached, the undersigned did not receive the Notice of References Cited. Transmittal of a copy of the form with the next communication from the PTO would be greatly appreciated.

By the foregoing amendments, claims 8 and 11 have been combined and claims which became redundant as a result thereof have been eliminated. As a result, it is respectfully submitted that the rejections in paragraphs 2 and 4 of the Office Action have been rendered moot.

Claims 1, 2, 3, 8, 9 and 11-17 were rejected under 35 USC 103 over Sekijima or Kimura in view of Baghdadi. This rejection is respectfully traversed.

When single crystals are grown without using a seed crystal, the crystals grow in the same way as their nuclei which are naturally generated and function as the seed crystals and accordingly, the crystals have random orientations. Because the physical properties of the materials are dependent on their crystal orientations, it is important to grow crystals so as to have their intended orientation and this generally requires using a seed crystal in the method. The use of such seed crystals makes the production process complicated.

The inventors of the present invention determined that when a fiber-shaped single crystal is 3 mm or less in diameter, the densest surface produced is in the free surface normal to the growth direction of the crystals. This permits orientation of growth of the crystals to be controlled.

The Sekijima and Kimura references, as recognized by the Examiner, do not teach a process of manufacturing a single crystal without using any seed crystal. In

addition, there is no teaching or suggestion in either of these references that when a fiber-shaped single crystal is 3 mm or less in diameter, the densest surface are best produced is in the free surface normal to the growth direction of the crystal.

The Office Action relies on the Baghdadi reference to show the formation of a monocrystalline material from a polycrystalline material without requiring the use of a seed crystal. It is argued that one skilled in the art would be motivated to eliminate the seed crystal because it makes the process less expensive and capable of high volume. Applicants respectfully disagree.

The Baghdadi reference relates to converting a polycrystalline semiconductor sheet to a monocrystalline semiconductor sheet through the use of a geometric restriction in the sheet. It does not relate to manufacturing a single crystal from a raw material polycrystalline rod. There is no basis for employing the sheet handling procedure of Baghdadi in the non-sheet procedures of Sekijima or Kimura, which require a seed crystal, nor is there any motivation to do so.

The passages of Baghdadi noted in the Office Action do not provide that motivation. They teach that the prior art process of growing ingot of a single crystal semiconductor material which is thereafter sliced, lapped and polished to produce thin wafers is expensive and that the invention described in Baghdadi provides a high volume, low cost alternative. However, the process described in Baghdadi involves using a sheet material, forming a region of small width in the sheet material heating the small width region and allowing a portion of the molten zone to solidifying into a seed crystal, etc. The absence of a seed crystal is not the reason for the high volume, low cost, and indeed a seed crystal is formed during the course of the process. Instead, the initial material is a sheet and this avoids the necessity of slicing, lapping and polishing an ingot. The proposed motivation is therefore inapplicable to the claimed invention.

While the Office Action additionally asserts that growth in the direction normal to the densest surface is inherent in the combination of processes proposed in the rejection because the resulting combined method is “similar” it is respectfully submitted that this assertion is not valid. In the first instance, any rejection based on inherency requires the inherency to be certain and not merely possible. Secondly, the examples in the present invention show that when the rod is 3 mm in diameter or less the desired result is achieved but when the diameter is 4 mm, it is not. A 4 mm process is as “similar” to the combined method as a 3 mm process. Accordingly, the alleged inherency does not exist. There is nothing in any of these references to suggest that growth will occur one way when the diameter is 3mm or less and in a different way when the diameter is 4 mm or greater.

Claims 4 and 10 were rejected under 35 U.S.C. 103 over the same combination of references in further combination of Cordova-Plaza or Kobayashi. This rejection is also respectfully traversed.

The prior combination of references has been discussed above. The additional references have been cited only to show the laser heated pedestal growth method exists but those references are not asserted to, nor in fact do they, cure the basic deficiencies in the other references when combined. The further combination of these two references with the prior combination cannot therefore, render the claimed invention obvious.

Claims 1-3 were also rejected under 35 U.S.C. 103 over Kou. This rejection is respectfully traversed.

The Kou reference was previously cited as a secondary reference and it does not, standing alone, render the invention of claims 1-3 obvious. This reference teaches

an apparatus for growing a monocrystalline body from a polycrystalline rod and as the Examiner has acknowledged, does not teach a fiber shaped single crystal of 3 mm or smaller in diameter. The process described in this reference relates to a float zone crystal growth process which employs a seed crystal. See, e.g., column 5, lines 18-22. There is only one exception and that occurs when one is growing single crystals of NaNO_3 . Only in this instance can the seed crystals can be eliminated (column 10, lines 19-21). There is no suggestion that the seeds can be eliminated with a respect to any other type of crystal. Sodium nitrate is a nitrate and not an oxide. The assertion that sodium nitrate is an oxide because NaNO_3 contains oxygen is not valid because by definition, an oxide is a binary compound containing an O^{2-} anion. The anion in sodium nitrate is NO_3^{-1} .

The assertions in the Office Action concerning inherency and Kou are respectfully submitted to be invalid for the reasons stated heretofore. Inherency requires identity and not mere similarity. Accordingly, a *prima facie* basis has not been presented to shift the burden to the Applicant to show a nonobvious difference and even if it had, the comparative examples in the present application satisfy that burden. There is nothing in the reference to show that one result occurs when the diameter is 3 mm or less and a different result occurs when it is 4 mm.

In light of all of the forgoing considerations, it is respectfully submitted that

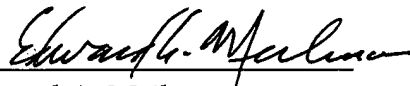
Application No.: 10/066,920

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this application is now in condition to be allowed and the early issuance of a Notice of Allowance is respectfully solicited.

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Respectfully submitted,

By 

Edward A. Meilman

Registration No.: 24,735

DICKSTEIN SHAPIRO MORIN &
OSHINSKY LLP

1177 Avenue of the Americas

41st Floor

New York, New York 10036-2714

(212) 835-1400

Attorney for Applicant